

**Towards Theory Building in E-Commerce: Identification of Pertinent Research Streams
and a Call for Further Research**

Nalini Govindarajulu

Ph.D. Student
Management Dept., MSC 3DJ
New Mexico State University, Las Cruces, NM 88003
Phone: (505) 646-5053, Fax: (505) 646-1372, ngovinda@nmsu.edu

Shalini Devi

Ph.D. Student
Computer Science Dept., MSC CS
New Mexico State University, Las Cruces, NM 88003
Phone: (505) 646-3723, Fax: (505) 646-1002, sdevi@nmsu.edu

Yiling Ge

Ph.D. Student
Management Dept., MSC 3DJ
New Mexico State University, Las Cruces, NM 88003
Phone: (505) 646-1201, Fax: (505) 646-1372, geyiling@nmsu.edu

Maria Gonzalez

Ph.D. Student
Industrial Engineering Dept., MSC 3449
New Mexico State University, Las Cruces, NM 88003
Phone: (505) 646-7234, Fax: (505) 646-3549, mtg3@nmsu.edu

David T. Loyd

Chief, Quality Assurance, Reliability & Safety Office
NASA JSC White Sands Test Facility
NS3, PO Box 20, Las Cruces, NM 88004
Phone: (505) 524-5282, Fax: (505) 524-5544, DAVID.T.LOYD@nasa.gov

Bonnie Daily

Associate Professor
Management Dept., MSC 3DJ
New Mexico State University, Las Cruces, NM 88003
Phone: (505) 646-2015, Fax: (505) 646-1372, bdaily@nmsu.edu

Abstract No: 002-0373

**Second World Conference on POM and 15th Annual POM Conference, Cancun, Mexico,
April 30 - May 3, 2004.**

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ABSTRACT

E-commerce technology is increasingly attracting the attention of researchers and managers in the 21st century. Despite this keen interest, the literature on e-commerce remains fragmented and ambiguous. Furthermore, an in-depth literature review shows that only few studies have examined major competencies in e-commerce that are relevant to the field of operations management.

Analysis of e-commerce issues in operations management will aid understanding and improvement of the challenges faced by organizations. In addition, firms will be able to formulate strategies and invest resources appropriately, when the specific factors that enhance manufacturing and service performance are determined. Moreover, knowledge of e-commerce issues is pertinent to achieving competitive advantage in an ever-changing economy.

Hence, the objective of this study is to highlight potential e-commerce research themes within the realm of operations management. This article reviews relevant literature on e-commerce in manufacturing and service operations. Employing focus group methodology, this paper also identifies pertinent research questions that are suitable for further conceptual modeling and empirical testing.

INTRODUCTION

Rapid changes in technology, products, processes, employee and customer needs, severe competition, and trends towards globalization, force organizations to do business in new ways in order to survive and be successful. One of these new trends is e-commerce, a form of entrepreneurial activity, which transforms the manner in which firms operate using the Internet.

This introduction of technology has been used mostly as a tool to deliver value to the customer (Starr, 2003) as a way to increase the core competencies. E-commerce has changed the traditional ways of business-to-customer (B2C) communication and business-to-business (B2B) communication (Steward, Callaghan, & Rea, 1999) and increased information-sharing among its members (Vakharia, 2002). Apparently, this new topic has attracted the attention of several researchers and practitioners.

Some researchers have focused on investigating the factors leading to the success of B2C e-commerce (Kendall & Kendall, 2001; Wolfinbarger & Gilly, 2001; Wu, 2003). Others have been more interested in studying how to increase the performance of supply chains through B2B e-commerce (e.g. Barnes, Hinton, & Mieczkowska, 2003; Hackney, Griffiths, & Ranchhod, 2002). However, researchers have pointed out that it is necessary for organizations to integrate demand chain and supply chain to be successful (Walters, 2002). Despite the recognizing the importance of integrating supply and demand chains, very few studies have considered the simultaneous implementation of e-commerce in B2C and B2B. In addition, few studies have compared the implementation issues between manufacturing and service organizations. Moreover, existing studies have not clearly captured the concept of e-commerce. Finally, the abundance of literature that exists seems very fragmented in nature.

Accordingly, the purpose of this paper is to provide a research outline for future studies in e-commerce. This framework includes determination of key factors that possibly influence e-commerce success by simultaneously considering suppliers and customers in the value chain.

This paper is organized as follows: The first section discusses the methodology employed to generate this research framework. Subsequent sections focus on identifying research problems and placing these issues within the relevant literature review. The research streams

identified are organized into the following sections: (i) definition and conceptualization of e-commerce, (ii) e-commerce issues in B2B and B2C, (iii) e-commerce in manufacturing, and (iv) e-commerce in services. The last section concludes the paper with some helpful guidelines on conducting research in this area.

METHODOLOGY

A focus group involves a small group of six to eight participants who engage in structured but open-ended discussions about a particular topic. The focus group process has been popular in marketing research (Goldman, 1962). This study used such a focus group procedure to discuss the future research agenda for e-commerce in operations. Accordingly, a group of six people with diverse academic and managerial expertise, including national and international experience, actively participated in this brainstorming session. This group consisted of an operations management faculty member, two senior doctoral students from operations management, two senior graduate students from industrial engineering, and a senior graduate student from computer science. All the group members had in-depth knowledge of the e-commerce and operations management literature. In addition, all the members were aware of the purpose of the focus group. The brainstorming session took place as part of a 3-hour doctoral seminar class in operations management.

The group analyzed the definition of e-commerce and the ambiguities associated with several descriptions in the literature. Next, the group focused on the manufacturing-end and outlined aspects of e-commerce (e.g., EDI, ERP, and intranet) that are currently utilized or could be utilized to improve efficiencies and effectiveness in manufacturing. Then the discussion moved to logistics issues (e.g., shipping, handling, & warehousing) to identify specific aspects of e-commerce that can improve logistics operations. Subsequently, the focus was on issues related

to the final customer (e.g., website design, web-based responsiveness, and web-based reliability). Finally the focus was on back-end operations and technical issues related to e-commerce. Here, the group discussed involvement of the workforce and online service providers in offering products and services using e-commerce technology.

Discussion of each area involved the following: (i) current research in the field, (ii) gaps in the literature, and (iii) guidance for future studies.

RESULTS AND ANALYSIS

Definition and Conceptualization of E-commerce:

Although e-commerce is widely discussed and studied, the definition is somewhat arbitrary. Besides, a single, clear definition delineating all the dimensions of e-commerce does not exist in the literature. This section lists some of the various definitions present in the literature.

The General Accounting Office (2002) provides a list of definitions of e-commerce defined by different organizations. For example, The U.S. Census Bureau defines e-commerce as “the value of any monetary transaction completed over a computer-mediated network that involves the transfer of ownership or rights to use goods and services.” This conceptualization includes the Internet, Intranet, Extranet, and EDI transactions. Similarly, eMarketer defined e-commerce as “Internet transactions in which the buyer completes the purchase order or transactional contract via the Internet.” This description includes only Web-based EDI. Another description given by Zwass (1996) includes e-commerce as “the sharing of business information, maintaining business relationships, and conducting business transactions by means of telecommunications.” This explanation is very broad, including all telecommunication transactions. Similarly, (Garrett & Skevington, 1999) describe e-commerce as “trading by means of new communication technology”, which “includes all aspects of trading, including commercial

market making, ordering, supply chain management, and the transfer of money.” In their thesis, e-commerce is not only defined as a new way of doing business, but also as a strategy which is associated with business models and practices enabling continuous improvements in transactions through internet.

Poulymenakou and Tsironis (2003) identified four categories of e-commerce: business-to-business (B2B), which comprises electronic transactions among business that cover business-to-business activities across supply chains; business-to-consumer (B2C), which links electronic transactions and communication between a firm and its final consumers; government-to-business, which emerges as an important policy and implementation instrument for global e-commerce market and global information society expansion; and government-to-citizen, which comprises the strategic use of the Internet as a channel for the provision of information and services to the citizens in public service sections. In addition, General Accounting Office (year) identified a new type of online interaction that is Consumer-to-consumer (C2C), such as eBay.

Existence of numerous definitions in the literature makes it challenging for researchers and practitioners alike to take further steps in studying the factors influencing e-commerce and the impact of e-commerce on manufacturing or organizational performance. In addition, the literature suggests various dimensions of the concept. Some of the ambiguous issues in the literature include the following questions: (i) Is there a concept called e-commerce (i.e., does it exist)? (ii) What are the specific technologies that are required for e-commerce? (iii) Are these technologies purely web-based or do they include usage of telephone, fax, and videoconferencing media? (iv) Does e-commerce entail information sharing among business partners only, or does it include consumers? (v) Does the conceptualization of e-commerce specify different dimensions

for B2B, B2C, and C2C users? (vi) Is e-commerce considered to be an operation, marketing, or business strategy, or a mere tool to aid information flow? (vii) Do e-commerce transactions have to be based on monetary value? (viii) Besides, does money have to be a direct (e.g., buying/selling products), or an indirect consequence (e.g., sharing inventory data or product designs that will ultimately result in exchange of money) of the transaction?

We propose that a first step in e-commerce research is to demonstrate a clear description of the concept. This should include specific dimensions that can be empirically measured with a validated scale. In this regard, we strongly encourage authors to study the literature carefully, conduct interviews with managers and users of e-commerce, and adopt rigorous qualitative and quantitative analyses to validate the concept.

Research on Business to Consumer (B2C) e-commerce:

According to the UCLA Center for Communication Policy, (2003), the number of Internet users in the U.S. increased from 66.9% in 2000 to 72.3% in 2001. However, the number who shopped online decreased from 50.7% in 2000 to 48.9% in 2001 and dropped even more to 44.5% in 2002. In order to narrow the gap between the stable increase in Internet access and decrease in number of consumers shopping online, studies have concentrated on B2C e-commerce to identify the factors that influence customers' intentions to purchase online. For example, Wolfinbarger & Gilly (2001) identified four specific attributes that attract most e-shoppers: convenience and accessibility, selection, availability of information, and lack of sociality. All these attributes could provide customers with freedom and control. Similarly, Park & Kim, (2003) surveyed 602 customers online and indicated that information quality, user interface quality, and security perceptions affect information satisfaction and relational benefits. These factors are in turn significantly related to customers' commitment to the website and actual purchase behavior. Also,

Wu (2003) identified 9 factors which will significantly influence customers' attitudes towards online shopping: effectiveness and modern, purchase convenience, information abundance, multiform and safety, service quality, delivery speed, homepage design, selection freedom, and company name familiarity.

Research on Business-to-Business (B2B) e-commerce:

B2B e-commerce manages a company's internal operations and supply chain cooperation activities in a wide range of industry (Steward, Callaghan, & Rea, 1999). Those business activities include order processing, invoicing, inventory control, collaborative product promotion and distribution, procurement, and supply chain management, (Poulymenakou & Tsironis, 2003). Based on the U.S Census Bureau (2003), B2B transactions account for 93% e-commerce revenue in the current market.

Basically, e-commerce provides companies the chance to collect, access, and analyze real-time information, thereby enhancing supply chain management decision-making (Vakharia, 2002). Studies showed that implementing e-commerce could help organizations and supply chains increase inventory turnover, lower costs, and faster delivery (e.g., Gavirneni, Kapuscinski, & Tayur, 1999; Iyer & Bergen, 1997; Lee, So, & Tang, 2000; Thonemann, 2000). As a result, some studies in B2B area focused on how to utilize real-time information sharing to improve the performance of the supply chain.

Studies in B2B e-commerce tend to be relatively broader in scope. For example, some researchers have studied ecommerce implementation from a strategy perspective (Barnes, Hinton, & Mieczkowska, 2003; Hackney, Griffiths, & Ranchhod, 2002). Others have investigated the application of different information systems and technology (Bensaou, 1997; Heart & Pliskin, 2002). Also, researchers have analyzed the influence of real-time information on different

business activities (Bourland, 1996; Thonemann, 2002).

Research on B2B and B2C:

Even though many studies on e-commerce exist, their focus is either on final customers (demand chain activities) or on suppliers (supply chain activities). Very few studies have tried to integrate B2C and B2B ecommerce. This is contrary to value chain theory, which suggests that integrating supply chain management and demand chain management will provide all enterprises in the chain with new opportunities to create market value (Walters, 2002). Furthermore, implementation of value chain management will facilitate customer satisfaction and competitive advantage in today's competitive business world (Walters, 2002). As a result, it is necessary for researchers to investigate e-commerce from the perspective of value chain. Specifically, researchers need to investigate factors determining success of the whole value chain, rather than focusing only on certain aspects of it.

Based on the brainstorming session, we identified pertinent research questions that need to be examined in the future. These include: (i) what type of e-commerce technology will be most effective in communicating and integrating the final customer's needs with all traders in the value chain (i.e, enhance B2B and B2C transactions and information flow simultaneously)? (ii) What are the barriers to effective implementation of e-commerce technology in the entire value chain? In this regard, it would be beneficial to identify barriers relevant to suppliers, manufacturers, retailers, transportation providers, consumers, and other members involved in producing and consuming products and services. Also, how can organizations minimize or eliminate these obstacles? (iii) What factors impede information flow across the value chain? How can organizations reduce or remove these impediments? (iv) What factors hinder co-ordination efforts in the value chain? How can organizations reduce or remove these barriers? (v) What is the most

effective combination of 'brick' (offline) and 'click' (online) factors to enhance productivity or other measures of performance? (vi) Is e-commerce technology the panacea for all operations problems? Specifically, are some types of value chains more efficient/effective without implementation of electronic commerce technologies?

Research on E-commerce in Manufacturing:

The achievement of quality products at low manufacturing costs is no longer a core competency among manufacturing firms (Soliman & Youseff, 2001). Firms have been increasingly trying to develop unique competencies by including e-commerce as an operation management strategy in the current globalized market (Silveira, 2003). Seeking e-commerce strategies has allowed firms to evolve into a flexible manufacturing environment in which the customer can ask for specific features in the design of the product (Soliman & Youseff, 2001). This evolution requires the transformation of the firm into a well-organized business characterized by the dynamic flow of information with both internal and external customers (Frazier, 1998). In order to achieve such transformation, a firm should determine a knowledge base of the company, structural, upstream and downstream competencies (Silveira, 2003). Subsequently, the adoption of technical tools such as CAD/CAM systems for manufacturing and design, business software as ERP (Enterprise Resource Planning), and EDI (Electronic Data Interchange) can ease the firm's operations in every aspect including managing orders, inventory, accounting, logistics and training (Min & Galle, 1999). As a result the firm will experience an actual improvement in current activities performed such as just-in-time policies (Min & Galle, 1999), as well as an evolution from a brick company into a network of virtual teams in which the transfer of data between suppliers can be done effectively on regular basis.

The literature on e-commerce in manufacturing highlights the importance of electronic

commerce tools in facilitating information flow, reducing inventories, speed of delivery, and implementation of other techniques such as just-in-time practices. The literature also suggests ease in usage of virtual teams with e-commerce. Finally, theory highlights the significance of e-commerce tools in providing customer value, satisfying the customer, and creating a competitive edge.

While the research points out the impacts of e-commerce on organizational goals and outcomes, little research exists in the following areas: (i) how can e-commerce tools aid 'virtual' factories? (ii) Which e-commerce tool(s) (e.g., Internet versus EDI) is most effective for manufacturing firms? (iii) What are the specific e-commerce tools required for the creation, maintenance, and easy usage of a 'knowledge' base? (iv) Does e-commerce promote better quality relationships among traders (e.g., suppliers, manufacturers, carriers, wholesalers, & retailers) in the value chain? (v) What are the shortcomings or limitations of e-commerce applications in the virtual factory? (vi) How can compatibility issues between different e-commerce tools (e.g., EDI used by suppliers & web-based technology used by producers) be solved? (vii) What are the specific types of employee training needed for effective implementation and use of e-commerce technologies in manufacturing? (viii) Will e-commerce technology, specifically web-based medium become a requirement (like ISO 9000) for suppliers and other traders to do business in the future? (ix) How can e-commerce technology enhance the selection, evaluation, and formation of partnership agreements with potential suppliers, buyers, and other traders in the value chain? (x) What challenges will manufacturers and other traders face in dealing with paperless transactions across the globe? The last two questions are especially relevant in today's manufacturing environment distinguished by global outsourcing.

Research on E-commerce in Services:

In the new world of e-commerce, perhaps the greatest challenge lies in understanding how to identify and capture the newest breed of customers. Many of the same service quality characteristics remain, but nuances are evolving every day with respect to the “e-customer’s” elusive mood, demographic, economic strength, and enthusiasm filtered through the keyboard and mouse.

To understand this new e-customer we must explore the basics of customer service before the home computer age. The most prominently cited characteristics of service quality is provided by Parasuraman et al (1985), who identify five attributes of service quality: Reliability, Responsiveness, Assurance, Empathy, and Tangibles. The authors’ SERVQUAL scale consisting of these dimensions continues to be used by academics and practitioners till date. Additionally, Voss (2003) proposed that the most obvious difference between typical service quality and “e-Service” is the lack of the human element – he dismisses “empathy” as a viable service characteristic in e-commerce. De-emphasizing the human element in e-commerce may mean the death of less empathetic e-businesses. Voss cites Bill Gates warnings about the necessity of human interaction in services. In the end, intelligent and empathetic qualities may be irreplaceable for services that emphasize: building trust and reassurance; providing diagnostic information; or simply answering specific concerns when e-mail or pre-established menu selections are not enough to meet customer needs.

Based on Parasuraman et al (1985), dimensions of service quality and other literature on services, some fruitful research questions were identified. These include: (i) Which e-commerce tool (e.g., Internet versus EDI) is most effective for service firms? (ii) Do the SERVQUAL dimensions have the same impact and importance to customers operating in a vastly different

“virtual” environment? (iii) Is empathy a service element that can be dismissed in order to achieve the greatest possible understanding of the e-customer? We believe dismissing any service quality elements is limiting the potential scope of e-commerce as a whole. Hence, further research is needed to adequately assess the importance and impact of SERVQUAL in e-commerce technology. (iv) Who are e-customers and what factors determine the growth of this market? (v) What does the e-customer value most in e-commerce? (vi) What opportunities can e-commerce seize to achieve e-customer loyalty? (vii) What are specific types of employee training needed for effective implementation and use of e-commerce technologies within services?

CONCLUSION

The literature on e-commerce issues in operations management has been somewhat limited in its focus and scope. One of the evolving theories in operations is the concept of value chain. However, few studies have examined e-commerce implementation issues in the value chain. Since extant research has stressed on either upstream (supply chain) or downstream (customer/demand chain) activities, we call for an integrated research agenda that studies both streams’ (value chain) operations simultaneously.

We have proposed a research outline on electronic commerce for manufacturing and service operations in the value chain. We have also identified four streams of research that are suitable for future research. We believe the development of a theoretical framework, the main contribution of this paper, will encourage debate about the direction of future scholarly research in this field. Besides, this research outline will help provide a focus and guide future research efforts.

Most of these research questions identified in this paper require analysis of either: purely technical issues (e.g., web design or online security), behavioral issues (e.g., motivation or

intention to shop online), organization design issues (e.g., structural design within and across organizations in the value chain), strategy and policy making issues (e.g., which types of products should be sold online), performance issues (e.g., what factors impact profitability the most), and/or a combination of all these issues.

It must also be noted that analysis of e-commerce issues across the value chain are inherently cross-disciplinary in nature. Readers and practitioners will be better able to understand and assess the impact of e-commerce issues when they are presented in an integrated framework. Accordingly, researchers should not be hesitant to employ multi-functional perspectives that address the research problems most effectively.

Furthermore, we strongly encourage researchers to consider different types of research methods in analyzing these research questions. These include but are not limited to best practices research, case studies, interviews, and survey research. Researchers can also use mathematical modeling such as simulation or optimizing techniques when addressing these issues. Given the global expansion of e-commerce, it would also be valuable to study these research questions in other countries. Finally, explicit consideration of type of product, process, and service, and firm size is necessary to derive meaningful conclusions.

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